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REACTIONS OF THE NASAL CAVITY AND POSTNASAL SPACE TO CHILLING OF THE BODY SURFACE

II. CONCURRENT STUDY OF BACTERIOLOGY OF NOSE AND THROAT

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By following the surface temperatures of skin and mucous membranes by means of thermopiles held in apposition with them, it has been possible to show that chilling of the body surface causes reflex vasoconstriction and diminished blood supply to the skin, palate and oropharynx,¹ the palatine tonsils,² and the nasal cavity and postnasal space.³ Concurrently with these experiments, the bacteriology of the throats and nasal cavities of the subjects have been studied in the hope of obtaining information regarding: first, the normal flora of healthy young men; and, second, any possible changes induced in that flora by the experimental procedure.

Bacteriologic data concurrent with the experiments in the nasal cavity and postnasal space follow. We would explicitly state again as we have before,² however, that the fluctuations in bacterial flora noted cannot with certainty be referred to the influence of the experiments with which they were correlated in time, nor can the influence of the experiments be attributed solely to the chilling involved. The protocols are given in some detail so that the evidence can better be evaluated.

Material and Method.—The medium employed was a 5% rabbit-blood meat-infusion agar. Cultures were taken from both sides of the nasal cavity, the right tonsil and the posterior wall of the oropharynx by separate swabs. The vestibule of the nose was wiped off with wet cotton before the nasal cultures were taken. Each swab was immersed in sterile broth and then applied to the blood-agar plate; the remaining area of the plate was inoculated by a platinum loop. Cultures were incubated for 36 hours. A number of colonies were then counted over

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¹ Mudd, S., and Grant, S. B.: *Jour. Med. Res.*, 1919, 40, p. 53.

² Grant, S. B.; Mudd, S., and Goldman, A.: *Jour. Exper. Med.*, 1920, 32, p. 87.

³ Mudd, S.; Goldman, A., and Grant, S. B.: *Jour. Exper. Med.*, 1921, 34, No. 1.

a portion of the plate, and the nature of each determined. Pneumococcus and nonhemolytic streptococcus were put in the same group because of the difficulty in differentiating these by their morphology.

Results.—Four subjects were used in this study. Cultures were made daily (with a few omissions), from June 21 to July 19, from 2 subjects, S. M. and A. G. Cultures were similarly made from the third, S. B. G., from June 21 to June 30, inclusive. Cultures were made from the fourth, F. J. C., only once. S. M., A. G. and F. J. C. each developed a mild coryza. S. B. G. was unaffected.

Subject S. M. showed in the nose from the outset *Staphylococcus albus*. On June 24 and thereafter, *S. aureus* also was found. Diphtheroids appeared in cultures from each nasal cavity made 4 hours after his third intranasal experiment. *S. albus* remained throughout all the experiments. *S. aureus* was present occasionally, but, except on the days following its first appearance, in smaller numbers than *S. albus*. The diphtheroids fluctuated in numbers and were sometimes absent. There was no apparent relation between their numbers and the chilling.

The tonsil contained at the outset nonhemolytic streptococcus, pneumococcus and *S. albus*. Streptococcus hemolyticus appeared in the tonsil culture taken 24 hours after the first experiment, on June 22; the applicator in this experiment was on the nasal septum, and the subject's mouth was closed. Forty-eight hours after the experiment, a pure culture of *S. hemolyticus* appeared on the tonsil plate. The number diminished on the following day to 11% of all colonies, and subsequently remained present in numbers 1 to 12% of all colonies counted, through July 12. Nose and throat remained clinically normal throughout this time. Further experiments were performed on this subject July 12, 15 and 17, with the thermopile tips respectively on the nasopharyngeal and oropharyngeal wall and in the air of the postnasal space. The proportion of hemolytic streptococci in the tonsil cultures slowly rose during this time—July 12, 12%; July 14, 16%; July 16 and 17, numerous, not counted; July 19, 25%; July 20, 36%. July 17, this subject began to develop symptoms of coryza. By July 19 he had cough, nasal stuffiness and rhinorrhea and malaise. Symptoms were present but abated the following day. This subject's mother had had a severe cold since about July 12; his symptoms may or may not have been connected with the experiments.

The pharynx showed nonhemolytic streptococcus and pneumococcus, and occasionally *S. albus* and *S. aureus*. June 27 *S. hemolyticus*

appeared and subsequently it was obtained in 4 cultures, each time associated with tonsil cultures containing a similar organism. *S. hemolyticus* is so usual an inhabitant of the tonsils⁴ that its incidence here may or may not have been connected with the experiments.

Subject A. G. showed in the nasal cavity initially *S. aureus*; subsequently *S. albus* appeared on each side. The right side showed usually a preponderance of *S. albus*, the left of *S. aureus*. No other organisms appeared in the nasal cultures.

The right tonsil showed a nonhemolytic streptococcus throughout, i. e., from June 21 to July 19. A. G. was the subject June 21, 23, and 24; application was made on the anterior end of the right nasal septum, the anterior end of the left lower turbinate, and in the left middle meatus, respectively. The symptoms of a slight rhinitis—nasal stuffiness, slight headache and slight mucopurulent discharge—developed June 24. The secretion and stuffiness persisted until June 29. June 24, two colonies of *M. catarrhalis* appeared on the tonsil plate, and June 26 one on the tonsil and three on the pharynx plate. June 28 *S. Albus* began to be present in the right nose. Otherwise no change in the bacteriologic condition was noted, the nose showing *S. aureus* and the tonsil and pharynx nonhemolytic streptococci as before. A. G. was again the subject July 7 and 17, with the applicator on the right middle turbinate in the first case and with no mucous membrane application in the second. July 17, twenty colonies (44%) of *M. catarrhalis* appeared on the tonsil plate. There were no accompanying clinical symptoms. *S. hemolyticus* appeared after the experiment of July 7, four colonies on the tonsil and one on the pharynx plate on July 7, one on the tonsil plate July 8, and one on the tonsil plate July 12. These were the only appearances of hemolytic streptococci in this subject either in the series of 1919 or of 1920.

In subject S. B. G. there were present in the nose *S. aureus* and *S. albus*. On the right tonsil there were a nonhemolytic streptococcus, pneumococcus, *S. aureus* and *S. albus*. The pharynx showed a nonhemolytic streptococcus and pneumococcus. There was practically no change in the bacterial flora throughout the period studied, nor were there any signs of a cold. The cultures from the pharynx were frequently sterile and always showed relatively few bacteria, as was the case in this subject in 1919.²

F. J. C., whose pharyngeal culture showed abundant hemolytic streptococci, developed a mild cold the day following his first experi-

⁴ Davis, D. J.: *Jour. Am. Med. Assn.*, 1920, 74, p. 317 and 75, p. 792.

TABLE 1
SUBJECT S. M. BACTERIOLOGY OF NASAL CAVITY, TONSIL AND PHARYNX

Time of Culture	Place Cultivated	Nonhemolytic Streptococci and Pneumococci			S. hemolyticus			S. aureus			S. albus			Diphtheroids			Remarks
		Number of Colonies Counted	Per-centage of All Colonies		Number of Colonies Counted	Per-centage of All Colonies		Number of Colonies Counted	Per-centage of All Colonies		Number of Colonies Counted	Per-centage of All Colonies		Number of Colonies Counted	Per-centage of All Colonies		
June 21 11 a. m.	Right side of nose...	0	0		0	0		0	0		100	0		0	0		Subject of exper. 6, 9:15 to 10:21 a. m. Application on right nasal septum
	Left side of nose...	0	0		0	0		0	0		100	0		0	0		
	Right tonsil...	20	67		0	0		10	33		0	0		0	0		
	Pharynx...	..	100		0	0		0	0		0	0		0	0		
June 22* 11 a. m.	Right side of nose...	0	0		0	0		0	0		0	0		0	0		Nose and throat normal. Subject of exper. 8, 3:40 to 4:57 p. m. Application on right inferior turbinate
	Left side of nose...	0	0		0	0		0	0		0	0		0	0		
	Right tonsil...	..	100		0	0		0	0		0	0		0	0		
	Pharynx...	..	100		0	0		0	0		0	0		0	0		
June 23* 11 a. m.	Right side of nose...	0	0		0	0		..	100		100	0		0	0		Nose and throat normal
	Left side of nose...	0	0		0	0		0	0		0	0		0	0		
	Right tonsil...	7	88		1	12		0	0		0	0		0	0		
	Pharynx...	0	0		0	0		0	0		0	0		0	0		
June 24 11 a. m.	Right side of nose...	0	0		0	0		5	25		75	0		0	0		Subject of exper. 25, 9:30 to 11:04 a. m. Application in right inferior meatus. Swab at 2 p. m. brought away blood from right side of nose
	Left side of nose...	0	0		0	0		100	0		0	0		0	0		
	Right tonsil...	0	0		0	0		..	100		0	0		0	0		
	Pharynx...	..	100		0	0		0	0		0	0		0	0		
June 25* 2 p. m.	Right side of nose...	0	0		0	0		0	83		0	0		8	17		Slight redness of right turbinates. Otherwise nose and throat normal
	Left side of nose...	0	0		0	0		40	0		63	0		3	14		
	Right tonsil...	100	89		12	11		5	23		0	0		0	0		
	Pharynx...	..	100		0	0		0	0		0	0		0	0		
June 26 11 a. m.	Right side of nose...	0	0		0	0		10	29		14	0		0	57		Nose and throat normal. Subject of exper. 26, 11 a. m. to 1:04 p. m. Application in nasopharynx. Applicator ill-fitting; considerable trauma of nasopharynx
	Left side of nose...	0	0		0	0		30	64		3	0		10	32		
	Right tonsil...	100 (app.)	99		1	1		0	0		0	0		0	0		
	Pharynx...	..	100		0	0		0	0		0	0		0	0		
June 27* 10 a. m.	Right side of nose...	0	0		0	0		13	43		9	0		15	45		Right inferior turbinate slightly reddened
	Left side of nose...	0	0		0	0		0	0		13	0		4	17		
	Right tonsil...	90	88		4	12		0	0		0	0		0	0		
	Pharynx...	37	92		3	8		0	0		0	0		0	0		
June 28 2 p. m.	Right side of nose...	0	0		0	0		0	13		87	0		0	0		Nose and throat normal
	Left side of nose...	0	0		0	0		20	57		15	43		0	0		
	Right tonsil...	30	79		1	3		0	0		7	18		0	0		
	Pharynx...	10	83		0	0		0	0		2	17		0	0		
June 29 11 a. m.	Right side of nose...	0	0		0	0		0	95		100	0		0	0		Slight secretion from both sides of nose; otherwise nose and throat normal. Subject of exper. 15, 3 to 4:37 p. m. Application in nasopharynx
	Left side of nose...	0	0		0	0		40	0		5	0		0	0		
	Right tonsil...	45	96		2	4		0	0		0	0		0	0		
	Pharynx...	3	14		0	0		0	0		86	0		0	0		
June 30* 12 m.	Right side of nose...	0	0		0	0		0	63		100	0		0	0		Nose and throat normal
	Left side of nose...	0	0		0	0		25	0		37	0		0	0		
	Right tonsil...	50	98		1	2		0	0		0	0		0	0		
	Pharynx...	..	100		0	0		0	0		0	0		0	0		
July 1	Right side of nose...	0	0		0	0		0	50		50	0		20	50		
	Left side of nose...	0	0		0	0		10	29		29	0		15	42		
	Right tonsil...	50	98		1	2		0	0		0	0		0	0		
	Pharynx...	23	96		1	4		0	0		0	0		0	0		

TABLE 2
SUBJECT A. G. BACTERIOLOGY OF NASAL CAVITY, TONSIL AND PHARYNX

Time of Culture	Place Cultivated	Nonhemolytic Streptococcus and Pneumococcus			S. hemolyticus			S. aureus			S. albus			M. catarrhalis			Undetermined		Remarks
		Number of Colonies Counted	Per-centage of All Colonies	Per-centage of All Colonies Counted	Number of Colonies Counted	Per-centage of All Colonies	Per-centage of All Colonies Counted	Number of Colonies Counted	Per-centage of All Colonies	Per-centage of All Colonies Counted	Number of Colonies Counted	Per-centage of All Colonies	Per-centage of All Colonies Counted	Number of Colonies Counted	Per-centage of All Colonies	Per-centage of All Colonies Counted			
June 21* 11 a. m.	Right side of nose... Left side of nose... Right tonsil... Pharynx...	0 0 23 0	0 100 92 0	0 0 0 0	.. 0 .. 0	100 0 100 100	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 2 0	0 0 8 0	Nose and throat normal at time of culture. Subject of exper. 27, 12:45 to 1:45 p. m. Application on anterior part of right nasal septum					
June 22 11:15 a. m.	Right side of nose... Left side of nose... Right tonsil... Pharynx...	.. 0 .. 32	.. 0 .. 80	0 0 0 0	0 0 0 0	100 100 100 100	0 0 0 0	0 0 0 20	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	Nose and throat normal					
June 23* 11 a. m.	Right side of nose... Left side of nose... Right tonsil... Pharynx...	0 0 0 0	0 0 0 0	0 0 0 0	.. 0 .. 0	100 100 100 100	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	Subject of exper. 2, 1:14 to 2:48 p. m. Application on anterior end of left lower turbinate body					
June 24* 11 a. m.	Right side of nose... Left side of nose... Right tonsil... Pharynx...	.. 0 .. 24	.. 0 .. 80	0 0 0 0	.. 0 .. 4	100 100 100 100	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 2	0 0 0 7	0 0 0 0	0 0 0 0	Headache and nasal "stiffness." Right side of nose; mucopurulent secretion; inferior turbinate small. Left side of nose normal. Subject of exper. 9, 12:08 to 1:24 p. m. Application in left middle meatus					
June 25 12 m.	Right side of nose... Left side of nose... Right tonsil... Pharynx...	0 0 0 0	0 0 100 0	0 0 0 0	.. 0 .. 0	100 100 100 100	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	Slight rhinitis. Swab of left side of nose brought away blood. Throat normal. Pharynx culture sterile					
June 26 11 a. m.	Right side of nose... Left side of nose... Right tonsil... Pharynx...	0 0 19 40	0 0 95 93	0 0 0 0	0 0 0 0	100 100 100 100	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 1 5	0 0 0 0	0 0 0 0	Left side of nose has little breathing space. Turbinates smaller. Right side of nose normal. Dull pain in left eye. Throat normal					
June 28	Right side of nose... Left side of nose... Right tonsil... Pharynx...	0 0 30 25	0 0 81 74	0 0 0 0	0 0 0 0	100 100 100 100	0 0 0 0	100 100 19 19	0 0 0 0	0 0 0 0	0 0 3 7	0 0 0 0	0 0 0 0	Nasal stiffness. Voice has nasal twang					
June 29 11 a. m.	Right side of nose... Left side of nose... Right tonsil... Pharynx...	0 0 40 100	0 0 80 100	0 0 0 0	1 0 0 0	11 100 90 100	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	Slight amount of secretion in both sides of nose. Right inferior turbinate almost occludes cavity. Left side of nose stuffy. Pharynx and tonsil normal					
June 30 12 m.	Right side of nose... Left side of nose... Right tonsil... Pharynx...	0 40 35	0 95 88	0 0 0	25 0 0	63 0 0	0 0 0	11 37 0	0 0 0	0 0 0	0 0 0	2 0 5	12	Nose and throat normal					

ment (applicator on left nasal septum). Unfortunately a contagious origin cannot be ruled out, however, for his baby brother developed a cold about the same time.

PROTOCOLS OF EXPERIMENTS INCLUDED IN TABLES 1 AND 2

Subject S. M.: Mouth closed; nose breathing, 14 respirations per minute. For dates, times and sites of application of mucous membrane thermopile, see table 1.

Exper. 6.—Room temperature 17-18 C.; 0 to 15.5 minutes, wrapped; 15.5 to 18.5, unwrapped, no fan; 18.5 to 29.7, unwrapped, fan on back; 24, ampule of amyl nitrite inhaled; 27.9, begins shivering; 29.7 to 66, wrapped. During the experiment the subject felt pain at times at the site of application; otherwise no particular sensation; no rhinorrhea.

Exper. 8.—Room temperature about 17 C.; 0 to 12.5 minutes, wrapped; 12.5 to 19, unwrapped, no fan; 19 to 48, unwrapped, fan on; 21.5, begins shivering; 39 to 41.7, inhales amyl nitrite; 48 to 77, wrapped; 54, slight readjustment of mucous membrane thermopile in nose, followed by two hard sneezes, lacrimation and rhinorrhea. After the experiment secretion was seen in both nasal cavities.

Note by subject after experiment:

"Some feeling of soreness on swallowing which feels as though localized on right side of midline at level of thyroid cartilage; due to traumatism in violent sneezing with which experiment ended. Rest of afternoon and until retiring at 9:45 p. m. felt slight soreness on swallowing. Next morning felt normal."

This sneezing may have expressed an infected plug from a tonsillar crypt and have been responsible for the appearance of hemolytic streptococci in the surface tonsil culture made the next day.

Exper. 25.—Room temperature about 15 C.; 0 to 10 minutes, wrapped; 10 to 16, unwrapped, no fan; 16 to 28, unwrapped, fan on; 28 to 51.5, wrapped; 43.2 to 45.2, amyl nitrite inhaled; 52, mucous membrane applicator removed; 60 to 75.5, wrapped, no fan; 75.5 to 85.5, wrapped, fan on; 85.5 to 93.5, wrapped, no fan.

Note by subject: "Attempt at applying thermopile to middle turbinate; after one insertion it was withdrawn and was noted to bear one fleck of blood. Considerable pain, sneezing, lacrimation and rhinorrhea caused by this attempt.

"Application made by slowly slipping thermopile along floor of nose until it wedged apparently between floor and middle turbinate with applying surface felt to be against lateral wall presumably in inferior meatus. Considerable rhinorrhea and sneezing caused by this procedure."

Exper. 26.—Room temperature about 18 C.; 0 to 14 minutes, wrapped; 14 to 23.2, unwrapped, no fan; 23.2 to 31, unwrapped, fan on; movements of pharynx; 31 to 69, wrapped; 69 to 78, unwrapped, fan on; repeated swallowing; 76.5, begins shivering; 78 to 97, wrapped; 97 to 123.5, unwrapped, fan on; repeated swallowing; 101, begins shivering; 103, teeth chattering; 118.5 to 122.2, amyl nitrite inhaled. Inhalation of amyl nitrite in this experiment which typically seemed to cause mouth to fill up with saliva and necessitated repeated swallowing. Swallowing in this experiment was extremely painful, due to ill-fitting applicator.

Exper. 15.—Room temperature about 19 C.; 0 to 20 minutes, wrapped; 20 to 44, unwrapped, fan on; 44 to 67, wrapped; 55.5 to 59.2, inhales amyl nitrite;

repeated swallowing as typically; 67 to 81, unwrapped, fan on; 76, begins shivering; 81 to 97, wrapped.

Exper. 14.—Zero to 10.5 minutes, wrapped; 10.5 to 26.5, unwrapped, fan on; 26.5 to 50, wrapped; 33.5 to 36.5, inhales amyl nitrite; repeated swallowing; swallowing not painful.

Exper. 18.—Room temperature 18-19 C.; 0 to 10 minutes, wrapped; 10 to 28.5, unwrapped, fan on; 30 to 38, wrapped.

Exper. 11.—Room temperature 16-17 C.; 0 to 22.6 minutes, wrapped; 22.7 to 28.7, unwrapped, no fan; 28.7 to 39.3, unwrapped, fan on; 29.5, begins shivering; 39.3 to 65.4, wrapped; 47.2 to 50.5 inhales amyl nitrite, much swallowing; 65.4 to 71, unwrapped, fan on. Blood flecks on applicator tip when withdrawn. Throat felt sore rest of day; next day soreness gone.

Exper. 22.—Room temperature 18-19 C.; 0 to 13.5 minutes, wrapped; 13.5 to 21.5, unwrapped, no fan; 21.5 to 41, unwrapped, fan on; 22.5, began shivering; 41 to 50, wrapped; 41, applicator felt painful in nasopharynx.

Exper. 21.—Room temperature 18.5-18.8 C.; 0 to 15.5 minutes, wrapped; 15.5 to 23, unwrapped, no fan; 23 to 36, unwrapped, fan on; 25.5, begins shivering; 36 to 58, wrapped; 45 to 48.5, inhales amyl nitrite; repeated swallowing.

Subject A. G.: Mouth closed; nose breathing, 14 respirations per minute. For dates, times and sites of mucous membrane application, see table 2.

Exper. 27.—Room temperature about 17 C.; 0 to 32 minutes, wrapped; 32 to 57.5, unwrapped, fan on; 36, begins shivering; 57.5 to 60.5, wrapped.

Exper. 2.—Room temperature 16 to 17 C.; 0 to 12 minutes, wrapped; 12 to 19.2 minutes, unwrapped, no fan; 19.2 to 38, unwrapped, fan on; 23.2 to 26.2, inhaled amyl nitrite; 38 to 88.5, wrapped; 76.1 to 78.5, inhaled amyl nitrite; 88.5 to 94, unwrapped, fan on.

Exper. 9.—Room temperature 16.5-16.8 C.; 0 to 21 minutes, wrapped; 21 to 28.5, unwrapped, no fan; 28.5 to 46, unwrapped, fan on; 38.2 to 40.2, inhales amyl nitrite; 41.7 begins shivering; 46 to 76, wrapped.

Note by subject: "Considerable pain felt when applicator was first inserted, and slight pain throughout experiment."

Exper. 28.—Room temperature 20.5 to 20.8 C.; 0 to 19 minutes, wrapped; 19 to 26, unwrapped, fan on; 26 to 47, wrapped; 47 to 70, unwrapped, fan on; back moistened at intervals; 56.5 to 58.5, inhales amyl nitrite; 70 to 78.5, wrapped.

Exper. 29.—Room temperature about 19 C.; 0 to 16 minutes, wrapped; 16 to 26.5, wrapped, fan on; 26.5 to 40, unwrapped, fan on; 40 to 45.5, wrapped, fan on; 45.5 to 50, wrapped, fan off.

DISCUSSION AND SUMMARY

Nonhemolytic streptococcus was found in all 4 persons studied, *S. hemolyticus* in 3, pneumococcus in 2, and *M. catarrhalis* in one. In S. M. on one occasion there was an abundance of *S. hemolyticus* in the tonsil cultures before and during the symptoms of cold and sore throat. In F. J. C. a cold followed a single exposure of a person with abundant hemolytic streptococci. The cases of S. M. and F. J. C., taken with a considerably less doubtful instance in S. M. in 1919,² are suggestive,

though not conclusive, of experimental excitation of throat infection by *S. hemolyticus*. They are of interest as contributing evidence in corroboration of recent studies incriminating this organism in upper respiratory infections, e. g., Barnes,⁵ Mathers,⁶ Floyd,⁷ Davis.⁴

The appearance of *M. catarrhalis* in A. G. after experimentation was paralleled by a like occurrence in the same subject in 1919,² and then, as in June, 1920, the appearance of this organism was to some degree correlated, in time at least, with clinical symptoms of infection.⁸

In our studies, as in that of Bloomfield,⁹ the occurrence of non-hemolytic streptococci was practically constant in the throats of all subjects, and pneumococci, hemophils, and gram-positive cocci were found somewhat less frequently in both series. Gram-negative cocci were much less in evidence in our studies than in Bloomfield's. *Streptococcus hemolyticus* also was somewhat irregularly present in the tonsil and pharyngeal swab-cultures of both series, and in several instances was in correlation with infectious symptoms.

In the nasal cultures both of 1919 and 1920 practically no organisms other than *S. aureus* and *S. albus*, and in one case diphtheroids, were found.¹⁰

⁵ The Tonsils, 1914, p. 67.

⁶ Jour. Infect. Dis., 1917, 20, p. 1.

⁷ Floyd, C.: Boston Med. and Surg. Jour., 1920, 182, p. 389.

⁸ Some months later, in November, 1920, A. G. suffered a severe attack of acute tonsillitis, with pus crypts and inflammation locally and constitutional symptoms. The house officer of the Barnes Hospital, St. Louis, who made cultures from the tonsils reported a few streptococci, a few staphylococci, but predominantly *M. catarrhalis*. We believe it improbable that this organism was the cause of his symptoms at this time, but it is at least of interest to have found *M. catarrhalis* in this one man, and not in any of the other 4 subjects studied, on 3 different occasions during a 17 month period.

⁹ Bull. Johns Hopkins Hosp., 1921, 32, p. 33.

¹⁰ For discussion of the relation of bacteria and of chilling to upper respiratory infection see Jour. Lab. & Clin. Med., 1921, 6, pp. 175, 253 and 322.